Abſtract of His Majesty's
ROYAL LETTERS PATENT.

GEORGE R.

Thos Gurney

George the Second, by the Grace of God, of *Great Britain*, *France*, and *Ireland*, King, Defender of the Faith, *&c.* To all and to whom theſe Preſents ſhall come, Greeting.

WHEREAS W. Bradford, R. Darby, and J. Hulls, have, with much labour and ſtudy, invented

A Portable Instrument
For detecting *Frauds* by
Counterfeit GOLD,

Which gives the Weight, and ſhews the Alloy, as well in Coin, as in all other Utenſils made with that Metal, with the quantity of Adulteration, in as little a Time as Gold is weigh'd. And whereas they have alſo invented

A new SLIDING-RULE,

which performs the ſame at one Operation as requires two or three on the Sliding-Rules hereto ſore made. And as it hath been made appear, that the ſaid Inſtruments will be very uſeful to our loving Subjects, We have moſt graciouſly granted unto the ſaid W. Bradford, R. Darby and J. Hulls, our Letters Patent, under the Great Seal of *Great Britain*, for the ſole Uſe and Benefit of the ſaid Inventions, within *England*, *Wales*, and Town of *Berwick upon Tweed*, alſo within our Colonies and Plantations abroad. And We do, by theſe Preſents, for Us, our Heirs and Succeſſors, require and ſtrictly command every Perſon and Perſons, Bodies Politic and Corporate, and all our Subjects whatſoever, of what State, Quality, Name, Condition, or Degree ſoever they be, within that Part of our Kingdom of *Great Britain*, called *England*, our Dominion of *Wales*, and Town of *Berwick upon Tweed*, alſo within our Colonies and Plantations abroad, that neither they, nor any of them, at any Time during the Term of Fourteen Years hereby granted, either directly or indirectly, do make or put in Practice the ſaid Inventions, or any Part of the ſame, nor in any wiſe counterfeit, imitate, or reſemble the ſame, or make any Addition or Subſtraction, to pretend themſelves the Inventors, upon ſuch Pains and Penalties as can or may be inflicted on ſuch Offenders, for their Contempt of this our Royal Command. In witneſs whereof, we have cauſed theſe our Letters to be made Patent.

Witneſs Ourſelf at Weſtminſter, *in the twenty-ſeventh Year of our Reign.*

THE

THE
ART of MEASURING,
Made EASY,
By the Help of a New
SLIDING-RULE;

WHICH
Performs the ſame at *One Operation*,
as requires *Two*, *Three*, or *More*,
On the SLIDING-RULES heretofore uſed.

IN A
Plain, eaſy, and conciſe Method, entirely new.

BY
W. BRADFORD, R. DARBY, and J. HULLS, PHILOMATH.
All of *Campden*, in *Glouceſterſhire*.

BIBLIOTHECA BODLEIANA

☞ For the Curious the Authors have *Sliding-Rules* of a particular Make, with *Braſs Slides*, at 7s. each.

STRATFORD: Printed by J. KEATING, 1765.
Of whom may be had the Gold Steelyards.

ADVERTISEMENT.

To be had of the Authors,
W. BRADFORD, R. DARBY, and J. HULLS.

The MALT-MAKER'S INSTRUCTOR,

(*Never before publiſhed.*)

SHEWING,

How any perſon, that can only multiply, may know the duty to a farthing, (according to Act of Parliament) of any quantity of malt, either in ciſtern, couch, or floor, without any regard being had to the number of buſhels; perform'd by multiplication only, in a ſpeedy method, entirely new. Alſo how to place the diviſions on a common dimenſion cane or ſtick, ſo that any perſon, wholly unacquainted with numbers, or the gauging inſtruments, may, in the tenth of a minute, know the duty, to the parts of a penny, of any quantity of malt contained in a ciſtern, frame, *&c.* without either pen, paper, or rule, or in the leaſt charging the memory. To which is added, by way of appendix, *Inſtructions to a* BREWER: Shewing how he may prepare a ſtick that will inſtantly tell, by inſpection, what the duty comes to of any liquor contained in any veſſel. Price *One Shilling.*

Of whom alſo may be had, Price 5s.

Their newly invented Inſtrument for detecting Frauds by Counterfeit Gold: Which gives the weight, and ſhews the alloy, as well in coin, as in all other utenſils made with that metal, with the quantity of adulteration (if any) in as little time as gold is weighed.

BODLEIAN

PREFACE.

THIS inſtrument recommends itſelf to the world, were it only for the eaſe and celerity in the performance of every operation, not being ſubject to the inconveniencies that attend the common ſliding rules; therefore it muſt of conſequence be acceptable to the young practitioner, or thoſe who require diſpatch.

As for inſtance, in meaſuring Timber or Stone: Let a piece of timber, or block of ſtone, or any other ſolid, be never ſo unequal ſided, and let the dimenſions be given in any denominations, this inſtrument will give the content at one ſet or operation, without being at the trouble of finding mean proportionals, as you are compelled to do in other ſliding-rules: And the making of 2 or 3 ſets gives a great deal of trouble, and is liable to many miſtakes, by reaſon we are generally compelled to carry a mixed number in the head, in order to proceed in the next operation: but here we are freed from that trouble and difficulty. And what further recommends it to the world, is the commodiouſneſs thereof and manner of uſe; for in other inſtruments you are obliged to ſtate the queſtion right to find the anſwer, but in this, if you ſtate the queſtion improperly, it will come right notwithſtanding, which renders it advantageous and eaſy, to thoſe that are unſkilled in arithmetick or common ſlides.

An inſtance in Brick Work.—Let the length and height of a wall be given, and the number of bricks thick, this inſtrument will give the content of any wall in rods, and reduce it to the ſtandard thickneſs at one operation: Alſo if the length and height of any wall be given, with the length and thickneſs of one brick, the inſtrument will ſhew, at one operation, the number of bricks it will take to build ſuch a wall.

It is alſo of great uſe in framing of timber for building, ſhewing the length of all hyps, vallies, gutter-pieces, or king-pieces, *&c.* at any pitch aſſigned, not only in ſquare buildings, but alſo in bevel roofs, which lengths cannot be found by any arithmetical proportions, or by any other ſliding-rule, yet are ſhewn on this by inſpection; and therefore not only of great uſe to the maſter builder, but alſo to the common carpenter, who is unſkilled in the rules of arithmetic.

Here are alſo many advantages in meaſuring Superficials, as well as Solids, by this inſtrument. As for inſtance:—If the content of a whole ſtock of boards be required, by ſetting the inſtrument for the length and breadth of one board only, you have the content of any number of theſe boards whatſoever. The ſlide being ſet for one board, the inſtrument is, in effect, a table of the contents of any number of boards, without moving any part of the inſtrument. If there are parts of a foot in one board, all the parts, as well as the feet, are ſummed together in the content of the whole ſtock, at the ſame operation.

In like manner may the Glazier ſum up the contents of any number of panes of glaſs at one ſet; or a Blackſmith the contents of ſeveral caſements.

For Paving.—Let the length and breadth of a floor, and the length and breadth of one brick, *&c.* be given, it ſhews at one operation, how many bricks, *&c.* will pave ſuch a floor. This inſtrument not only ſurpaſſes the common ſlides in thoſe particulars, but alſo in many more of great conſequence; but we ſhall only inſtance in the following, *viz.*

There are but few uſeful queſtions in buſineſs relating to the meaſuring of Solids (except cylinders) that can be anſwered at one ſet of the ſliding rules now in uſe; for we ſeldom meet with a piece of timber or ſtone to be meaſured, that hath equal ſides, therefore cannot be anſwered at one ſet on the common ſliding-rules; unleſs there be a line fitted by the inſtrument-maker for one particular purpoſe; then the ſaid rule is rendered uſeleſs in all other caſes, and will not caſt up any Solid that is in any other form: or if the dimenſions are given, or the content required, in any other denomination than what the rule was made for, it will not anſwer the queſtion. But this inſtrument remedies all thoſe inconveniencies in the ſliding-rules now in uſe; for if the dimenſions be given or required in what denominations ſoever, or different denominations, it anſwers the queſtion with the ſame ſpeed and exactneſs, as if given or requir'd in any particular denomination.

There are a great many more Solids that the ſliding-rule will not caſt up at one operation, which this inſtrument will, with eaſe and ſpeed;

as triangular priſms, pyramids, eliptical cones, globes, &c. alſo thoſe whoſe baſes are eliptical or parallelograms, rhombus, rhomboides, triapeziums, poligons, and many other.

In fine: This inſtrument multiplies any three numbers together ſucceſſively, and divides that product by any other number, at one ſet of the ſlide, which comprehends all the moſt uſeful queſtions relating to meaſuring of Superficials and Solids. It alſo performs the compound or Double Rule of Three, containing five numbers given to find a ſixth, which no other ſliding-rule will perform at one operation.

The uſe of this inſtrument is ſo much eaſier learnt and underſtood than the ſliding-rules now in uſe, that any perſon, unſkilled in arithmetic or ſliding-rules, may, with the directions given, be capable of giving the content of any timber, ſtone, brick-work, gauging, paving, tiling, plaiſtering, painting, &c. in a more eaſy method than hath been hitherto uſed.

The Price of the RULE *is* Five Shillings.

But if any perſon hath already a Carpenter's Common Sliding-Rule, and is not willing to be at that expence, may have the Braſs Furniture added to it, to ſlide on or take off at pleaſure; which makes it as compleat for all purpoſes, as the rule above-mentioned; without taking any more room in the pocket, or in the leaſt defacing or damaging the rule.

The Price of the ſaid Furniture is Two Shillings.

A Book of Directions, Six Pence.

THE

THE
ART of MEASURING
Made Eaſy.

The DESCRIPTION *of the* RULE.

THE Rule conſiſts of five lines, mark'd A, B, C, D, and E; the lines mark'd A, B, C, are placed as in other rules, and counted in like manner, from the left hand towards the right. The line D is an additional line, to move only in rectiſying the inſtrument for any particular purpoſes; which line D is an inverted line of numbers, and therefore counted from the right hand toward the left.

To ſhew the ſeveral uſes of the before-mentioned inſtrument, obſerve as follows: Suppoſe you would find the number 53 on the line D, look the figure 5, and call it 50, as you may do on the lines A, B, and C. as occaſion requires, and for 3 take the three ſmall or ſubdiviſions toward the left hand: and ſo of any other number on the line D.

Note. The line D is never to be moved, but in rectiſying the inſtrument; that is, ſetting it to its proper gauge point for particular purpoſes you want it for.

It is alſo to be obſerved, that the figure 1, or unity, on any part of the rule or braſs, may be called 1, 10, 100, or 1000, &c. ſo conſequently if unity is called 10, number 2 will be 20, number 3 will be 30, &c.

Again, If unity is called 100, number 2 will be 200, number 3 will be 300; and ſo of the reſt.

In rectifying the inſtrument, you have no more to do but to place number 1 or 10 on the line D, to its proper diviſor or gauge point on the rule, and proceed as ſhall be hereafter taught.

When 1 or 10 on the line D is rectified to its proper diviſor, it is indifferent which radius or part of the ſlide or line you make uſe of, ſince all numbers on the lines may be called either units, tens, or hundreds, &c. as mentioned before.

[We hope no perſon will be offended at our familiar explanation of the lines of numbers, for that is intended only for the uſe of thoſe who are wholly unacquainted with it: But as the rules may drop into perſons hands that have no knowledge of the lines, this explanation is inſerted for their inſtruction.]

The uſe of the line E will be ſhewn in its proper place. [See page 29]

Note. There is another ſort of rules, which may be made to any length required, without a joint, containing two ſlides, which performs all its operations exactly in the ſame manner as the joint rule before mentioned, and lines placed on it, with this ſmall difference only; the lines D and E, on the braſs furniture, are placed on the oppoſite ſide of the braſs to each other, whereas on this rule, with two ſlides, the lines D and E are both placed on one ſide, and ſeparated by theſe marks ***, yet are to be uſed in the ſame manner as thoſe on the braſs for the joint rule.

Before we give any example on the rule, obſerve, That when the content of anv ſolid is required in a greater denomination than the dimenſions are given, in that caſe, the ſaid dimenſions are to be multiplied together, and divided by a fixed number, in order to anſwer the queſtion: therefore a diviſor may be placed by a mark on the rule, for any purpoſe whatſoever, either for Engliſh or foreign meaſures, that are not mentioned in this treatiſe; and ſuch diviſor may be placed againſt either of the radiuſes which will beſt admit the number 1 or 10 on the line D to be placed to.

In the next place, I ſhall give ſome examples of the application of thoſe lines on the rule; and firſt,

Of unequal ſided *Timber*, or *Stone*.

THE length of unequal ſided timber is moſt frequently taken in feet, and the breadth and depth in inches: when thoſe dimenſions are multiplied together, they are to be divided by 144, to give the content in ſolid feet; and to perform this by the rule, firſt place the end of the braſs as at 10, to the ſaid number 144 on the line C, where there is a point on the oppoſite part of the rule mark'd timber; and there let it always remain to meaſure unequal ſided timber. The inſtrument being thus rectified, you have no more to do but to bring either of the three given dimenſions on C to either of the other two on D, and againſt the other on A you have the anſwer on B.

EXAMPLE I.

SUPPOSE a piece of timber be 22 feet long, 18 inches wide, and 13 thick, what is the content?

Your line D being placed for unequal ſided timber, as is before taught, by ſetting 10 on D to 144 on C, mark'd timber, then bring 18 on C to 13 on D, then againſt 22 on A, you have 35 and 7-10ths of a foot on B, the content.

As you have, in theſe caſes, always three numbers given, *viz.* length, breadth, and depth, it is equal which of thoſe numbers you ſet firſt, ſecond, or laſt, in caſe you ſet either two of the three on C and D, and look againſt the other on A, and you have the anſwer on B; therefore the queſtion cannot be ſtated wrong, let which numbers or dimenſions ſoever you make uſe of be firſt or laſt; for, as in the aforeſaid queſtion, if you ſet 13 and 22 together on C and D, then againſt 18 on A you have the ſame anſwer 35,7 feet; and ſo alternately.

EXAMPLE II.

LET a piece of timber be 20 feet long, 16 inches wide, and 6 deep, what is the content?

Bring 16 on C to 6 on D, and againſt 20 on A you have 13 and 3-10ths, the content on B.

EXAMPLE III.

A PIECE of timber 22 feet long, 20 inches wide, and 15 thick?

If you bring 20 on C to 15 on D, then againſt 22 on A is 45,8 feet on B, the anſwer.

There are other advantages in meaſuring timber by this inſtrument; as, ſuppoſe you were to meaſure all the timber for a whole building, and you begin and end one ſort firſt; bring the breadth on C to the thickneſs on D, then you need not move any part of the inſtrument 'till you have ſummed up all the contents of the timber of that ſort, be it ever ſo much, and all different lengths: Then it is but moving the ſlide once to another breadth and thickneſs, and caſt up all the next ſort that is in the whole work, before you move any part of the inſtrument, be the lengths ever ſo different.

I have given the more examples in thoſe firſt inſtances propoſed, by reaſon all problems in the following work are anſwered in the ſame manner.

Of *Round Timber*.

ROUND timber is moſt commonly meaſured by taking one fourth of the girt, and call it the ſquare of the piece. Tho' it is well known this method is very erroneous, yet there is good reaſon to be given, why this cuſtom ſhould prevail in meaſuring rough timber, or otherwiſe there ſhould be more difference in the price between the rough and ſquared timber, conſidering the great waſte in ſquaring.

When a piece of timber is work'd up in a round form for any purpoſe, it ought to be meaſured as a cylinder, which method gives the true ſolid content.

I ſhall give an example of each method, to be uſed as occaſion ſhall require.

To meaſure a round tree the cuſtomary way, the line D remains as before in ſquare timber.

EXAMPLE.

IF a piece of round timber is 36 feet long, and the girt 44 inches, then one fourth of the girt is 11 inches; ſet 11 on C to 11 on D, and againſt 36 on A you have 30,2 feet, the content on B.—Let the ſame piece be meaſured as a cylinder, to give the true content, move 1 to or on the braſs, or line D, to the gauge point mark'd O, whoſe diviſor is 1810; then bring 44 (the circumference in inches) on C to the ſame number on D, and againſt the length of feet on A you have the true content on B, 38,48 feet: But if the diameter is given in inches, and the length in feet, move the braſs to 183 on C, mark'd cylinder, and bring the diameter on C to the ſame number on D, and againſt the length of feet on A you have the content in feet on B The diameter of the aforeſaid piece is 14 inches bring 14 on C to 14 on D, and againſt 36 (the length) on A you have the true content on B, *viz.* 38,48 as before.

Of *Blocks of Stone.*

IN meaſuring blocks of ſtone, all the dimenſions are commonly taken in inches; in that caſe your diviſor is 1728: To anſwer thoſe queſtions, bring the end of the braſs to the mark at the word ſtone on the rule, which is againſt 1728 on C; then to meaſure a ſtone, or any other ſolid, by this diviſor, as you have three dimenſions, *viz.* length, breadth, and thickneſs, (all taken in inches) bring either of the two numbers together on C and D, and againſt the other number on A, you have the content at one operation.

EXAMPLE.

LET a block of ſtone, or any other ſolid, be 50 inches long, 30 wide, and 15 thick; the inſtrument being rectified, and as you have three numbers before you [50, 30, and 15] it matters not which of the three you begin with; ſuppoſe you bring 30 on C to 15 on D, then againſt 50 on A you have 13 feet, and ſomething more, on B: or,

If you bring 30 on C to 50 on D, then againſt 15 on A you have the ſame anſwer; and ſo on alternately.

Of

Of *Brick-Work.*

BRick-work is meaſured by the rod of 16 feet and a half long, therefore a ſquare rod contains 272 feet and the 25th part of a foot. When a wall is a brick and a half, or three half bricks thick, and is 272 ſuperficial feet and one fourth of a foot, it is ſaid to be a rod, ſtandard-meaſure.

☞ The thickneſs of any brick wall is counted by the number of half bricks.

When a wall is more or leſs than three half bricks thick, it is reduced to the ſtandard meaſure, as followeth: Let it be required to give the content of a wall, and to reduce it to the ſtandard meaſure at one operation; bring the end of the braſs to the point at brick-work, whoſe diviſor is 816,75 on C, and there let it remain for thoſe purpoſes; then bring the length of the wall in feet on C to the height on D, and look againſt the number of half bricks the wall is in thickneſs on A, and you have the content, ſtandard meaſure, at one operation.

EXAMPLE I.

LET a wall to be meaſured be 50 feet long, 30 feet high, one brick and half thick, what is the content?

To anſwer this queſtion, bring 30 on C to 50 on D, and againſt 3, the number of half bricks thick, on A you have the content 5,5, which is five rods and a half, ſtatute meaſure.

Now you have not only the content of this wall at ſtatute thickneſs, but alſo the content thereof at any thickneſs, at one and the ſame operation, without moving any part of the inſtrument: For look againſt 5 half bricks on A, and you have 9,2 rods, which ſhews that this wall is 9, 2 rods ſtatute meaſure, at two bricks and one half thick.

Again, Look againſt 4 half bricks on A, and you have 7,35 rods at 2 bricks thick, all at one ſet of the inſtrument: Or, Look againſt any other thickneſs on A, and you have the content, ſtatute thickneſs, on B. The inſtrument being thus ſet for any wall, is, in effect, as a table of the ſeveral contents of that wall at any thickneſs.

EXAMPLE II.

LET a wall to be meaſured be 73 feet long, and 24 high, and 3 bricks and one half thick, which is 7 half bricks, what is the content?

Bring 73 on C to 24 on D, and againſt 7 on A you have 15,1 rods, at ſtatute meaſure.

* * *

To know how many BRICKS *will build any wall, the dimenſions being given, with the length and thickneſs of one brick only, at one operation.*

AS bricks are not of one ſize in different countries, therefore there muſt be a new gauge point found, if the bricks are of a different ſize from the ſtatute; which will be ſhewn hereafter. The gauge point for the ſtatute bricks is,1562; to rectify the inſtrument for the ſtatute bricks, ſet the end of the braſs to ,1562 on C, mark'd S. B. and let it remain there for bricks of ſtatute meaſure.

EXAMPLE I.

IF a wall be 30 feet long, and 8 high, and 3 half bricks thick, how many bricks will build that wall?

The inſtrument being rectified, bring 30 on C to 8 on D, and againſt 3 (the number of half bricks thick) on A you have the content 46 9. Again: Suppoſe a wall is 5 half bricks thick? Look againſt 5 on A, and you have 7610 on B, the anſwer: And ſo of any other thickneſs, at one operation.

EXAMPLE II.

LET a wall be 30 feet long, and 20 high, 4 half bricks thick, what is the content?

Bring 53 on C to 20 on D, or, which is the ſame, bring 20 on C to 53 on D, and againſt 4 (the number of half bricks thick) on A you have the content, 27137.

Then admit you are in a country where the bricks are 9 inches and a half long, and 2 inches and three quarters thick, how many bricks will build a wall that is 40 feet long, and 7 high, and 4 half bricks thick?

To find this or any other gauge point for thoſe purpoſes, at one operation, (as in this example) to rectify the inſtrument, bring 133 on B to the length of this brick (9 inches and a half) on A, then bring 1 or 10 on D to 2 and 3-4ths on C, and your inſtrument is rectified to the proper gauge point, 18,14, for bricks of this ſize. Then to find the number of bricks in this wall, bring 40 on C to 7 on D, and againſt 4 (the number of half bricks) on A you have 6173, the content on B.

* * *

To find any GAUGE POINT *by numbers, for bricks of any ſize.*

MULTIPLY the length of the brick in inches into the thickneſs in inches, and add a competent number of cyphers, and divide that ſum by 144, the quotient will be a decimal, ſhewing where to fix the line D; and when the line D is fixed to the quotient on C, it may remain there to anſwer all queſtions for this purpoſe relating to bricks of the ſame ſize.

What proper allowance is neceſſary to be made for mortar or lime, muſt be added to the length and thickneſs of one brick, in making the gauge point.

Obſerve, That when a perſon is in any country where the bricks are different from the ſtatute-meaſure, and hath occaſion to uſe a gauge point for a particular ſize, it will be proper to make a mark on his rule, for the more eaſy rectifying the inſtrument for the ſize he at any time wants it for.

Some Examples in GAUGING.

And firſt, *Of* Malt.

THE method heretofore uſed to gauge malt, is by an inverted line fixed on the officer's rule, particularly adapted to the gauging of malt, therefore unity on the ſaid line is fixed to 2150 againſt the line C; and when the number of buſhels is found by the rule, the duty is known, by having recourſe to a table for that purpoſe, which is called moneying the charge: But this inſtrument ſhews, at one operation, what the duty comes to (according to act of parliament) of any quantity of malt, either in ciſtern, couch, or floor, without any regard being had to the number of buſhels, by having the dimenſions in inches given: Alſo, we ſhall ſhew how, by the inſtrument, to make a compariſon, and to know where the charge will ariſe, either from the couch or floor.

When a quantity of malt is thrown out of the ciſtern any ſpace of time, not exceeding thirty hours, the allowance, according to law, is no more than 1-5th, or 4 buſhels in 20; but when it hath exceeded thirty hours, it is gauged as a floor-gauge; that is, with the allowance of 10 in 20, or one half, and ſo on to the kiln.

EX-

EXAMPLE I.

IF a couch of malt be 86 inches long, 82 wide, and 18 deep, what is the duty in ſhillings and parts?

To rectify the inſtrument for couch gauges, always ſet unity on D to 537 on C, and let it remain; then bring two of the three dimenſions together on C and D, and againſt the other on A you have the number of ſhillings the duty comes to: As in this example; Set 18 on C to 82 on D, and againſt 86 on A you have 23, and ſomething above a half on B; therefore the duty comes to 23*s.* 7*d.* and ſo of any other.

Then for a floor gauge you have no more to do but to place the line D to 86 on C, and ſuppoſe the aforeſaid malt when in the floor is more advanced in bulk, the dimenſions are as follow, *viz.* 194 long, 87 wide, and 11 deep, ſet the dimenſions as before taught, bring 194 and 87 together on C and D, and againſt 11 on A you have 21,5 on B, which is 2*s.* 1*d.* leſs than the couch; therefore the charge ariſeth from the couch.

The method of gauging by this inſtrument being ſo eaſy, it is needleſs to give examples of every particular part of the work, ſince all diviſors are readily found on the lines, therefore I ſhall only mention one or two General Rules: For, in rectifying the line D, always ſet unity on D to the proper diviſor on C, when even with A, and proceed as before taught in other caſes. As when you gauge a brewer's cooler, or back, at one operation, 1 or 10 on the line D is placed to 282 [the diviſor] on C; then proceed as in other problems, and you have the anſwer in ale gallons on B.

To gauge a Brewer's Cooler *that is in an elliptical form, at one operation.*

PLACE unity on D to the gauge points for circles, *viz.* 359, mark'd A.G.R.V. denoting ale gallons in round veſſels; then bring the conjugate diameter and the tranſverſe together on C and D, and againſt the depth on A you have the content in ale gallons on B; and ſo of any other.

N. B. If any ſolid or veſſel is to be meaſured or gauged, and is in a cylindrical form, the inſtrument is to be rectified to its proper diviſor, then bring the diameter on C to the ſame number on D, and againſt the length on A is the content on B.

* * *

Of *Land Meaſure.*

THIS inſtrument is uſeful to thoſe who often ſet or take reaping, breaſt plowing, hoeing, or any other work by the acre, and are unacquainted with ſurveying or meaſuring of land; for if the length and breadth of a piece of land be given in yards, this inſtrument gives the content in acres, and alſo ſums up what money the work comes to, at any price whatſoever, all at one and the ſame operation.

To rectify the inſtrument for this purpoſe, when the dimenſions are taken in yards, always bring 1 or 10 on the line D to 4840, mark'd L denoting land meaſure, and let it remain always for this purpoſe; then bring the length and breadth together on C and D, and againſt 1 on A you have the number of acres on B; and alſo againſt the price per acre in ſhillings on A, you have the ſum of money in ſhillings it comes to on B.

EXAMPLE I.

LET a piece of land be 290 yards long, and 50 wide, how much does it come to reaping, at 5*s.* per acre?

The inſtrument being rectified, bring 290 and 50 together on C and D, and againſt 1 on A you have 3 acres, very nearly, on B; then look againſt 5 [the price in ſhillings per acre] on A, and you have almoſt 15*s.* on B; and ſo of any other price at the ſame operation.

To lay out a piece of land in ſingle acres.

RECTIFY the inſtrument to land meaſure, whoſe diviſor is 4840, if the dimenſions are taken in yards; then let a piece of land be of any length, the breadth is found that makes an acre, without moving any part of the inſtrument. Look againſt any length on C and you have the breadth on D; or look againſt any length on D, and you have the breadth that makes an acre on C.

EX-

EXAMPLE II.

IF a piece of land be 250 yards long, look againſt 250 on either of the lines C or D, and you have 19 and 3-10ths, and that breadth will make an acre at the aforeſaid length.

Again, If a piece of land be 95 yards long, look againſt 95 and you have 51; and ſo of any other, without moving any part of the inſtrument.

N. B. If the dimenſions are taken in chains and links, the lines C and D are to ſtand even; that is, unity on D to unity on C, then it is performed in the ſame manner as before.

* * *

A catalogue of the gauge points uſed in the preceding work, to rectiſy the inſtrument for the purpoſes herein treated of.

Note. Either unity or 10 on the line D, which can be moſt conveniently placed to the diviſor, is brought to the ſaid number on C, when ſet even with A, and moſt of the uſeful gauge points are mark'd with proper letters, ſignifying the purpoſe they are to anſwer.

General Rules.

WHEN the length of a board, &c. is taken in feet, and the breadth in inches, the diviſor is 12, marked boards.

When the length of a piece of timber or ſtone is given in feet, and the breadth and depth in inches, the diviſor is 144, mark'd timber.

When the dimenſions of any ſolid are given in inches, the diviſor or gauge point is 1728, to bring it into feet, mark'd ſtone.

When the diameter of a cylinder is given in inches, and the length in feet, the diviſor is 183, mark'd cylinder.

When the circumference of a cylinder given in inches, and the length in feet, the diviſor is 1810, mark'd O.

When the dimenſions of a brick wall are taken in feet, with the number of half bricks thick, in order to bring it into rods, the diviſor is 816, mark'd brick work.

To know what number of ſtatute bricks will build any wall, the diviſor or gauge point is ,1562, mark'd S. B. denoting ſtatute bricks.

The diviſor for malt buſhels, mark'd MBSV in ſquare veſſels, is 2150; the diviſor for malt in round veſſels, is 2738, mark'd M B R V.

Ale gallons in ſquare veſſels is 282, mark'd A G S V.

Ale gallons in round veſſels, the diviſor is 359, mark'd A G R V.

Wine gallons in ſquare veſſels is 231, mark'd W G S V.

Wine gallons in round veſſels, the diviſor is 294, mark'd W G R V.

When the dimenſions of a couch of malt is given in inches, and the duty in ſhillings required, the diviſor or gauge point is 537, marked C, denoting couch.

When a floor gauge is given in inches, and the duty in ſhillings required, the diviſor is 86, mark'd F. denoting floor gauge.

For land meaſure, when the length and breadth are given in yards, to find the content in acres, and alſo to ſum up the money it comes to, the diviſor is 4840, mark'd L, denoting land meaſure.

In laying out of land in ſingle acres, the braſs is at the point aforeſaid, *viz.* 4840.

When the length and breadth are given in chains and links all the lines are ſet even.

When the dimenſions of any ſuperficials or ſolids are given in the ſame denomination the content is required in, there is no diviſor; for in thoſe caſes the line D is ſet even with the lines A B C; that is, unity to unity.

Note. That when the lines D or E on the braſs are at any time mention'd, it is to be underſtood the ſame as line D or E on the rule before-mentioned.

* * *

Of *Board Meaſure.*

TO give the content in feet of a whole ſtock of boards, by taking the dimenſions of one board only, at one operation, and to rectify the inſtrument for that purpoſe, bring 1 on D to board on the inſtrument, whoſe diviſor is 12, and let it remain there always for meaſuring boards, &c. where the diviſor is 12, then bring the breadth of one board in inches on C to the length in feet on D, then againſt the number of boards on A you have the content of the whole ſtock on B.

EXAMPLE I.

IF a ſtock of boards [13 in the ſtock] are 15 inches wide, and 14 feet long, what is the content?

Bring 14 on C to 15 on D, then againſt 13 on A you have 228 on B, the content of the whole ſtock. Or, find any number of boards on A, and againſt it you have the content on B.

EXAMPLE II.

LET a ſtock of boards be 17 inches wide, and 9 feet long, what is the content at one operation, of 1 2 3 4 5 or 6 boards?

Bring 9 on C to 17 on D, then againſt any number of thoſe boards on A you have the reſpective anſwer, Againſt 1 board on A you have 12 and 7-10ths, the content on B.

Again, Look againſt 2 boards on A, and you have 25,5 the content on C, and ſo of the reſt: For,

Againſt Number	1	on the line A you have	12,7	on the line B.
	2		25,5	
	3		38,2	
	4		51	
	5		63,7	
	6		76,5	

Therefore, this inſtrument being ſet for the dimenſions of any board, it is, in effect, a table of anſwers for any number of thoſe boards whatſoever.

In like manner may a glazier ſum up the content of any number of panes of glaſs at one ſet; or a blackſmith the contents of ſeveral caſements.

EXAMPLE.

LET a pane of glaſs be 3 feet, or 36 inches high, and 19 inches wide, what is the content? In this caſe your diviſor is 144.

Your inſtrument being rectified, bring 19 on C to 36 on D, then againſt 1 on A you have 4,75 on B; againſt 2 panes on A you have 9,5 on B; againſt 3 on A you have 14,25 on B; and againſt 4 on A you have 19 feet on B; and ſo of any other number of panes, without moving any part of the inſtrument.

If the lengths or heights had been taken in feet, and the breadth in inches, your diviſor would be 12.

Some general obſervations for the uſe of young practitioners, to be made on the lines of numbers, mark'd A B C D.

AS ſometimes 1 on the line is called 10 or 100, *&c.* [as is before hinted] again, ſometimes 10 or 100 on the rule is called but 1, or 1-10th, *&c.* and the other numbers are reckoned according as number 1 is called therefore in the uſe of our ſliding-rule it is equal if either 1 or 10 on the line D is brought to your diviſor or gauge point you are going to make uſe of. Alſo, it is equal which radius or part of the ſlide you ſet to the line D, or which radius or part of the line A you ſeek your third number on, in order to find the anſwer on B. When a queſtion is propoſed, it is eaſily ſeen which radius is moſt conveniently brought to the number propoſed, and alſo on which radius on the line A you look on to find your anſwer on B; for there is not any number will fall off the lines in uſing theſe rules.

Of *framing of timber for building.*

IN this place we ſhall ſhew the uſe of the rule in framing of timber for building.——When the line mark'd E is applied to the lines of numbers mark'd A B C, it gives the length of all hyps, valleys, gutter-pieces, king-pieces, *&c.* at any pitch aſſign'd, not only in ſquare building, but alſo in bevel roofs, which lengths are not found by any arithmetical proportion, yet are here ſhewn by inſpection.

To rectify the inſtrument, place unity or 1 on E to 1 or 10 on the lines of numbers, and let it always remain there for thoſe purpoſes.

If half the breadth of the building and length of the rafter be given, to find the hyps at the common pitch.

Note. Half the breadth of the building is made uſe of in the following work, by reaſon half the breadth of the building, the rafter and height of the roof, compleat a rectangular plain triangle; and half the breadth of the building, the rafter, and hyp, make a rectangular plain triangle alſo.

The common pitch is, if one half the breadth of the building be 10, the rafter is 15; therefore bring 10 on C to 15 on E, and againſt one half the breadth of any building on B, is the length of the hyp on A.

EXAMPLE I.

IF half the breadth of the building be 12. look againſt 12 on B, and you have 21,6 the hyp, on A. Or, if the half breadth be 9, look againſt 9 on B, and you have 16,2 on A, the length of the hyp; and ſo of any other, without moving any part of the inſtrument.

Note. When the ſlide is at any time placed for thoſe purpoſes, it anſwers to all buildings whatſoever of the ſame pitch, without moving any part of the inſtrument, let the breadth be never ſo different, at one and the ſame operation, But if the pitch be different from the common pitch, as ſuppoſe the proportion is as 10 to 18, which is above common pitch, you have no more to do but to move 10 on C to 18 on E, and againſt one half the breadth on B, you have the length of the hyps on A of any building, at ſuch pitch, without moving the inſtrument. If the building is the ſquare pitch, which is under the common pitch, always bring 10 on C to 14,14 on E, and againſt one half [the breadth of any building] on B is the length of the hyps on A, at that pitch. If one half of the building at that pitch be 8, then againſt

8 on B is 13,8 on A; and ſo of any other. If the proportion of the pitches be not given, it is inſtantly found by the lines A and B; thus, ſet one half of the breadth of the building on B to the length of the rafter on A, and againſt 10 on B is the proportion of the pitch on A.

EXAMPLE II.

LET one half the breadth of the building be 8, and the rafter 11 2-10ths, ſet 8 on B to 11 2-10ths on A, and againſt 10 on B is 14 on A, the proportion of the pitch; then the pitch being known, proceed as before; that is, always bring 10 on C to the pitch on E, as in this example is 14, and againſt one half [the breadth of any building] on B, is the hyp on A, as againſt 8, the half breadth on B, is 13,7 on A, the hyp; and ſo of any other, without moving any part of the inſtrument.

General Rules.

WHEN half the breadth of the building, and the rafter is given, and the pitch unknown, to find the hyp always bring one half [the breadth] on B to the length of the rafter on A, and obſerve what number 10 on the ſlide ſtands againſt on A; then you have no more to do but to bring 10 on the ſlide to the ſame number on the line E, as it ſtood againſt on A, and againſt one half [the breadth of any building] on B you have the length of the hyp on A. Or, if the hight of the roof, and half of the breadth be given, and the pitch unknown, to find the length of the rafter always, in thoſe caſes, ſet the leaſt of the given numbers on B, to the other on A, and, as before, obſerve what number on A 10 on the ſlide reſts at; then bring 10 on the ſlide to the ſame number on the line E as it ſtood at before on A, and againſt the leaſt of the before given numbers on B you have the length of the rafter on A.

In the preceding work there were two legs, namely, the baſe and perpendicular of a rectangular plain triangle given to find the diagonal: When the diagonal and one leg is given to find the other leg, it is only the reverſe of the former prepoſitions. If in the triangle A D O in the following diagram, there is given the perpendicular A D, 16,6, and the diagonal A O, 24,4, to find the baſe O D, ſet 16,6 on the line B to 24,4 on A, and againſt 10 on the ſlide is 10,8 on the line E; then ſet 10 on the ſlide to 10,8 on A, and againſt 16,6 on B is 18 on A, the length of the line D O. Thus the inſtrument ſolves all rectangular plain triangles, by inſpection without either angle being given.

Of *Bevel Roofs.*

AS it often happens, that the boundaries of the ground intended to build upon are not exactly ſquare; therefore, if the ends of the building are hypt, thoſe hyps conſequently will be of different lengths; then for the eaſy finding thoſe lengths, on the rule, is the deſign of the following propoſitions.

EXAMPLE.

ADMIT a building to be 24 feet wide, the bevel 8 feet, the wall plate at the bevel end 25 and 2-10ths, and the rafter 18 feet, what is the length of either of the hyps?

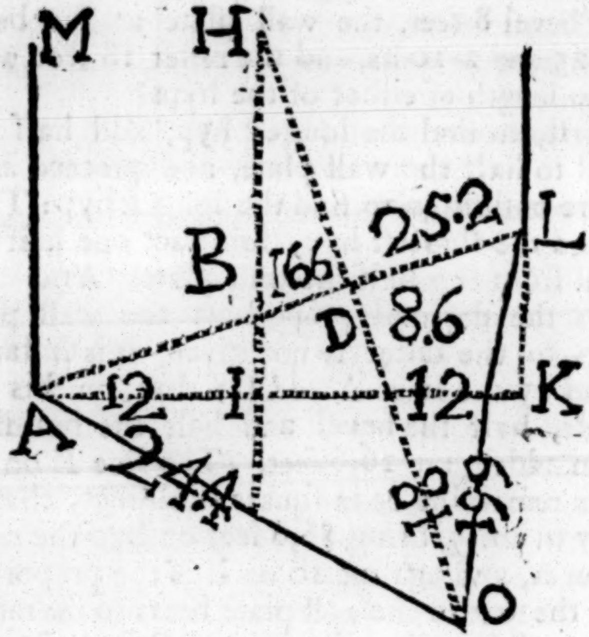
Firſt, to find the longeſt hyp, add half the bevel to half the wall plate, and proceed as in ſquare buildings, to find the longeſt hyp: Then to find the ſhorteſt hyp, ſubſtract one half the bevel from one half the wall plate. And

As the decimal proportion the wall plate bears to the rafter is not given, it is inſtantly found by the lines A and B; thus, in this example, half the bevel and half the building, when added, are 16,6 feet. The line E on the braſs remaining as in ſquare buildings, that is, unity to unity, bring 16,6 feet on B to the rafter 18 on A, and againſt 10 on B is the proportion that the part of the wall plate bears to the rafter, *viz.* 10,8 feet; then bring 1 on C to 10,8 on E, and againſt 16,6 on B you have the length of the hyp on A. 24,4 feet.

Then to find the ſhorteſt hyp, ſubſtract 4, the half of the bevel, from 12,6, the half of the wall plate, and there remains 8,6; then as the proportion is not given, it may be found as before; ſet 8,6 on B to 18 on A, and againſt 10 on B you have 20,9, the proportional number the ſaid part of the wall plate bears to the rafter; then to find the hyp, place 10 on C to 20,9 on E, and againſt 8,6 on B you have the length of the hyp on A, 19,9 feet; and ſo of any other.

The

The DIAGRAM.



EXPLANATION.

THE diagram (being a geometrical conſtruction of the example in page 32) ſhews how to protract the dimenſions of any ſquare or bevel roof. Draw a line at pleaſure, as A I K; at I erect a perpendicular I H, then from a ſcale of equal parts, ſet off half the breadth of the building from I to K, and alſo from I to A, and erect a perpendicular at each end of the line A K; then ſet off the bevel from K to L, and draw the line A L; then ſet off one half the bevel from B to D, being the point where the rafter at the end interſects the wall plate; then raiſe a perpendicular on the line A L at D, and prolong it 'till it interſects the line I H at H, which repreſents the perpendicular point under the interſection of the rafter, ridge, and hyps; then prolong the line H D equal to the length of the rafter from D to O.—A line drawn from A to O, and meaſured on the ſame ſcale, gives the length of the longeſt hyp, and a line drawn from L to O, and meaſured on the ſame ſcale, gives the length of the ſhorteſt hyp.

In like manner may the lengths of the hyps, valleys, &c. be found in any building, be it either ſquare or bevel.

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from D to D, being the point where the rafter [illegible] the end intersects the wall plate [illegible] perpendicular on the line A B at D, and [illegible] that intersects the line I H at K, [illegible] presents the perpendicular [illegible] [illegible] of the rafter [illegible] [illegible] equal to the [illegible] of the rafter from D to E [illegible] and [illegible] of the [illegible] [illegible] the

In [illegible] all [illegible] be at [illegible] the [illegible]

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No 3. When the dimensions are taken in poles, set the braſs at 160 then length & breadth on slide & braſs then opposite to 1 on A you have the content in Acres on the Slide.

Various ways of finding the Contents when the dimensions are in chaines & linkes.

The Most useful.

1. When taken in chains & links & only one breadth — place the L. always on slide against 160 on Braſs. and opposite to the

breadth on A. you have the
contents on the slide in poles.